

In [1]:

```
import numpy as np
import pandas as pd
import math
```

In [2]:

```
lead_concentrations = np.array([6.7, 5.4, 5.2, 6.0, 8.7,
                                6.0, 6.4, 8.3, 5.3, 5.9,
                                7.6, 5.0, 6.9, 6.8, 4.9,
                                6.3, 5.0, 6.0, 7.2, 8.0,
                                8.1, 7.2, 10.9, 9.2, 8.6,
                                6.2, 6.1, 14.1, 10.6, 8.4])

lead_concentrations
```

Out[2]:

```
array([ 6.7,  5.4,  5.2,  6. ,  8.7,  6. ,  6.4,  8.3,  5.3,  5.9,  7.6,
        5. ,  6.9,  6.8,  4.9,  6.3,  5. ,  6. ,  7.2,  8. ,  8.1,  7.2,
       10.9,  9.2,  8.6,  6.2,  6.1, 14.1, 10.6,  8.4])
```

In [3]:

```
lead_mean=np.mean(lead_concentrations)
lead_mean
```

Out[3]:

```
7.2333333333333325
```

In [4]:

```
lead_std=np.std(lead_concentrations,ddof=1)
lead_std
```

Out[4]:

```
2.0450669550346543
```

In [5]:

```
lead_var=np.var(lead_concentrations,ddof=1)
lead_var
```

Out[5]:

```
4.182298850574712
```

In [6]:

```
a=lead_mean+lead_std
```

In [7]:

```
b=lead_mean-lead_std
```

In [8]:

```
within_one_std=lead_concentrations[(lead_concentrations<=a) & (lead_concentrations>=b)]
within_one_std.size
```

Out[8]:

```
24
```

In [9]:

```
a_2=lead_mean+2*lead_std
b_2=lead_mean-2*lead_std
```

In [10]:

```
within_two_std=lead_concentrations[(lead_concentrations<=a_2) & (lead_concentrations>=b_2)]
within_two_std.size
```

Out[10]:

```
29
```

In [11]:

```
pi_25=np.percentile(lead_concentrations,25)
pi_25
```

Out[11]:

```
6.0
```

In [12]:

```
pi_75=np.percentile(lead_concentrations,75)
pi_75
```

Out[12]:

```
8.25
```

In [13]:

```
IQR=pi_75-pi_25
IQR
```

Out[13]:

```
2.25
```

In [14]:

```
pi_10=np.percentile(lead_concentrations,10)
pi_10
```

Out[14]:

```
5.1800000000000001
```

In [15]:

```
pi_90=np.percentile(lead_concentrations,90)
pi_90
```

Out[15]:

```
9.3400000000000002
```

In [16]:

```
suspected_outliers=lead_concentrations[(lead_concentrations<=pi_25-1.5*IQR) | (lead_concentrations>=pi_75+1.5*IQR)]
suspected_outliers
```

Out[16]:

```
array([14.1])
```

In [17]:

```
prob_seventh_order_stat=math.comb(8,7)*(0.7)**7*(0.3)+math.comb(8,8)*(0.7)**8
prob_seventh_order_stat
```

Out[17]:

```
0.2552983299999999
```

In [18]:

```
prob_seventh_order_stat_2=math.comb(8,7)*(0.7)**7*(0.3)+math.comb(8,6)*(0.7)**6*(0.3)**2+math.comb(8,5)*(0.7)**5*(0.3)**3
prob_seventh_order_stat_2
```

Out[18]:

```
0.7482476399999998
```

In []: